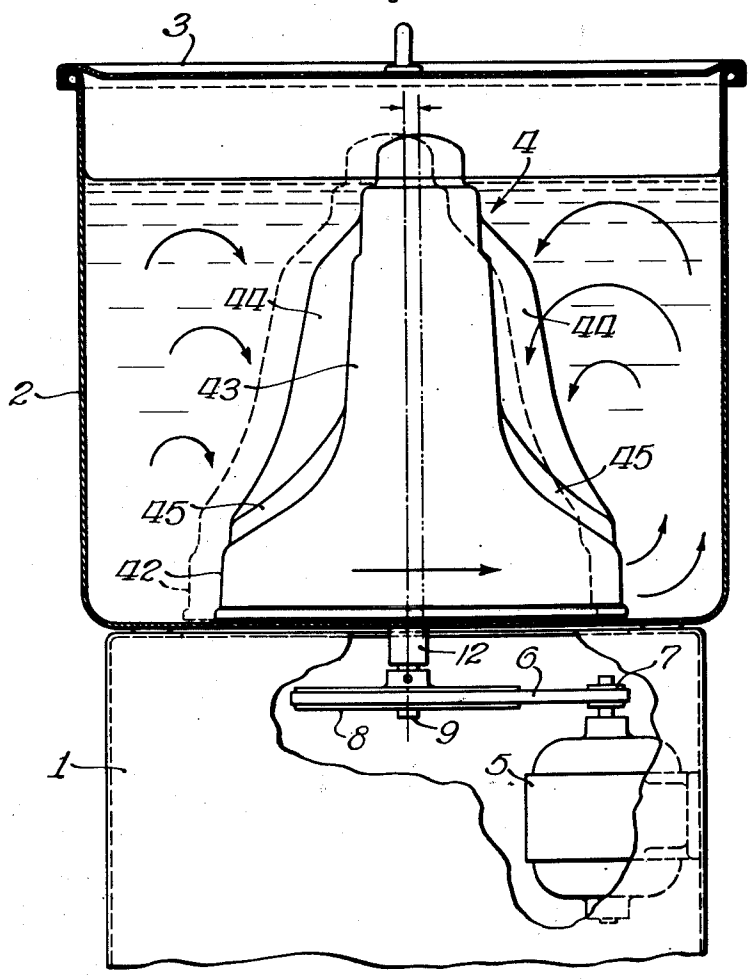
Dec. 26, 1950 J. A. CASTRICONE 2,535,390

CLOTHES WASHING MACHINE

Filed Aug. 20, 1946 2 Sheets-Sheet 1

Fig. 1.



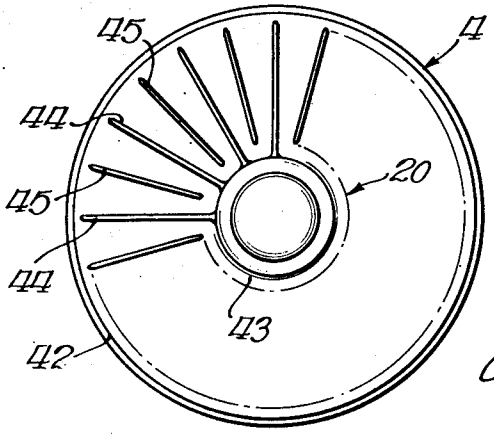


Fig. 2.

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CLOTHES WASHING MACHINE

Filed Aug. 20, 1946 2 Sheets-Sheet 2

Fig. 3

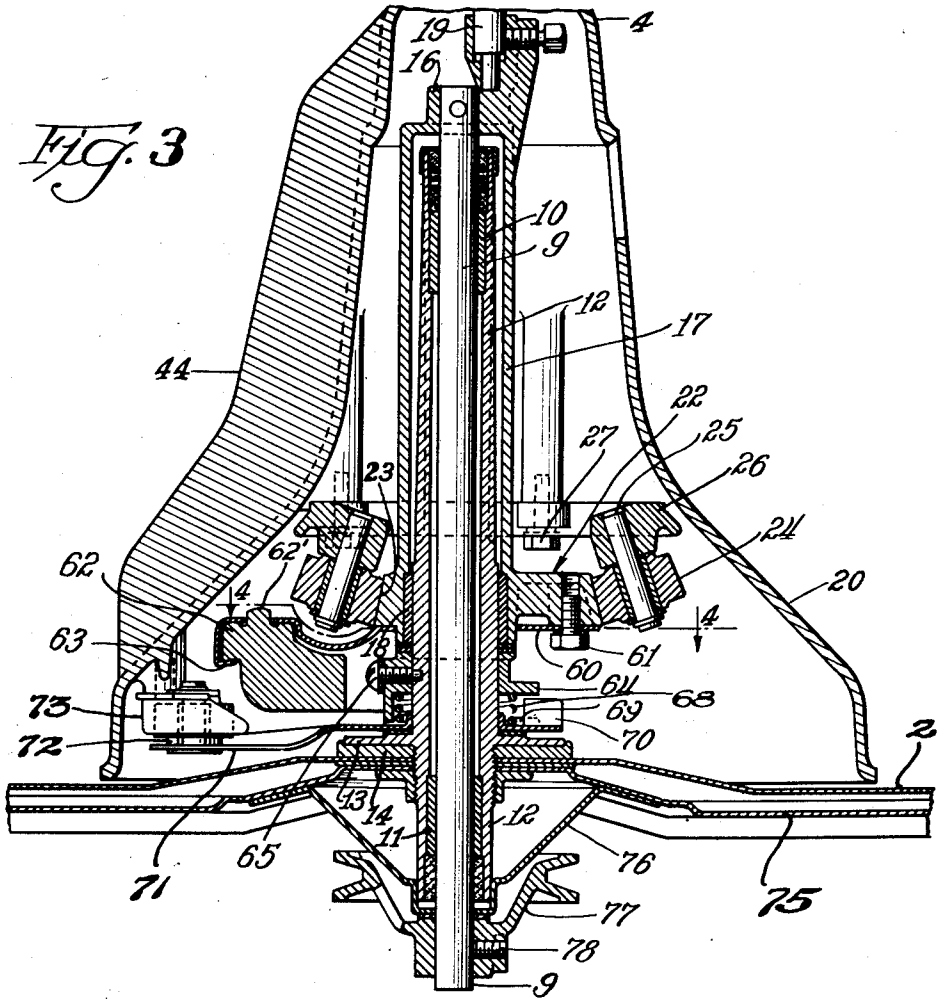
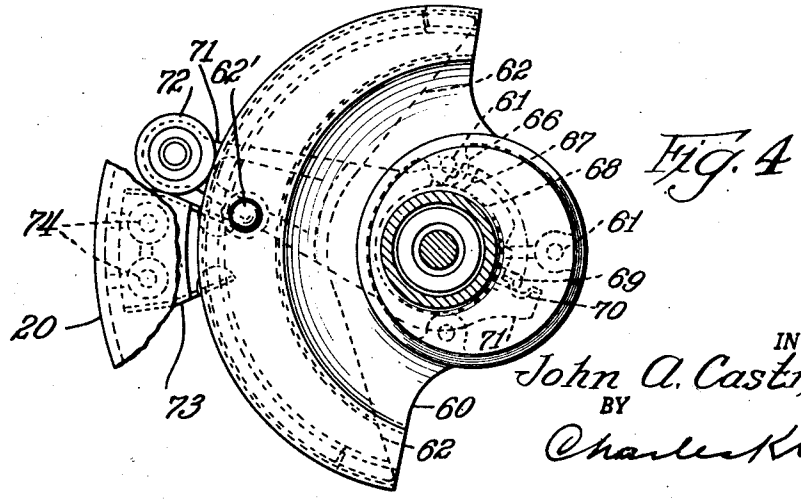


Fig. 4



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UNITED STATES PATENT OFFICE

2,535,390

CLOTHES-WASHING MACHINE

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Application August 20, 1946, Serial No. 691,688

9 Claims. (Cl. 68—131)

1

This invention relates to clothes washing machines and is particularly concerned with the improvement in the operating principle and mechanism of the previously accepted practice in domestic washing machines. It is a continuation-in-part of my copending application, Serial No. 647,565, filed February 14, 1946, now Patent No. 2,416,611, granted February 25, 1947.

As set forth in my prior application, I have provided a unidirectional orbital dasher in the tub for acting on the clothes to accomplish a washing action thereof by a light rubbing motion. This eliminates the expensive construction of reversing gearing required in washing machines heretofore where reversed direction agitators were used.

One object of this invention is to improve the action of the orbital moving dasher, to provide more uniform motion thereof without vibrations, and to counter-balance the out-of-balance eccentric rotation of the dasher, especially for relatively long throw of circular orbit or relatively high speed of movement through the orbit, or both.

Another object is to provide in a rapid unidirectionally rotating orbital dasher washer, means to balance the rapid unidirectionally rotating mechanism so that the washing mechanism will be smooth and quiet, particularly at a relatively high speed.

The machine is designed to incorporate a light unidirectional rotating rubbing action of a multivane dasher moving in an orbital path of small radius. I designate the washing element as a "dasher" because of its reciprocating action without axial rotation as contrasted with the axial reversed rotation of the agitator or impeller of the conventional submerged agitator washing machine.

It is a further feature of the present invention to provide a dasher that is mounted for floating or restrained axial rotation upon its supporting bearings and which moves bodily in an orbit with respect to its driving axis so that, although the normal movement of the dasher is devoid of axial rotation, under uneven load conditions, the dasher may move axially to avoid jamming of bunched clothes. The dasher normally stands still on its axis while being moved in an orbit about its driving shaft but upon contacting bunched clothes may rotate slowly or slightly to effect a uniform disposition of the clothes around the tub wall.

The restrained rotation is accomplished preferably by providing a slip clutch mechanism operatively connected with the dasher and carried

2

upon the fixed column providing the bearing structure for the dasher. This slip clutch mechanism acts normally to restrain the dasher from turning on its mounted bearing axis while moving about the drive shaft. However, this restraining action may be effected by a spring which would permit the dasher to yield and rotate slightly when meeting an obstruction. Such movement of the dasher will depend largely upon the loading of the machine as determined by the movement of articles of clothing within the tub and upon the size and weight thereof and their grouping during the operation of the washing machine. Although the dasher is restrained from rotation, as above explained, it is worthy of careful note that the clothes will continually be slowly rotated around the tub which further effects the equal distribution of clothes in the tub.

Provision is made also for counterbalancing the offcenter positioning of the dasher with respect to the drive shaft, and its operation through a circular orbit, as by mounting a counterweight on the dasher shaft on the opposite side of the drive shaft from the axis of the dasher.

All other objects and advantages inherent in the washing machine of the present invention shall be referred to in the following detailed descriptions having reference to the accompanying drawings forming part of this specification.

In the drawings:

Fig. 1 is a diagrammatic side elevational view of the washing machine of the present invention having certain parts broken away and in section to illustrate the general details of construction thereof;

Fig. 2 is a plan view of the dasher per se as seen when removed from the machine;

Fig. 3 is a vertical transverse cross-sectional view of the main working parts of the machine and more specifically through the dasher structure and its mounting; and

Fig. 4 is a horizontal cross-sectional view taken substantially along the line 4—4 in Fig. 3.

Fig. 1 illustrates a washer having a base 1, supporting a tub 2 provided with the usual lid 3. The tub has dasher mechanism 4 of the present invention diagrammatically illustrated as mounted for operation substantially centrally of the washing tub 2.

A motor 5 is conveniently mounted within the base 1 of the washing machine to operate the dasher 4 through a belt drive 6 connecting the motor pulley 7 with the dasher driving pulley 8, and the latter is secured to the main drive shaft 9 of the dasher. Obviously, it is to be noted

that the entire drive is unidirectional and extremely simple, with no gearing or gear box, and only a minimum number of moving parts.

Referring now to Fig. 3, the shaft 9 is rotatably mounted in bearings 10 and 11 secured in spaced relationship in a fixed center post 12. This center post 12 is provided with an annular flange 13 that is secured upon a plate 14, said plate being conveniently secured to the base of the tub in any desired manner whereby the post 12 is fixed to the tub 2.

The upper end of the shaft 9 is fixed rigidly to a cap 16 that is secured to and forms a part of a depending driving sleeve 17 which is concentrically disposed with respect to the shaft 9 and rotates upon a bearing 18 secured to and surrounding a portion of the post 12. A crank pin 19 is secured to the cap 16 in offset relation to the axis of the shaft 9, producing an eccentric drive, but with the axis of said crank pin 19 preferably spaced inwardly from the periphery of the major portion of the length of the sleeve 17. The dasher 4 has a main body 20 provided with an upper bearing bushing journaled on the crank pin 19 supporting the dasher 4 thereon for relative rotation about the axis of the pin 19.

The depending end of the sleeve 17 terminates in an eccentric 22 having a conically tapered bearing surface 23. A plurality of rollers 24 are journaled upon pins 25 mounted in a ring 26 which is secured by means of suitable screws 27 to the body 20 of the dasher. These rollers 24 are conically positioned to engage properly the surface 23 of the eccentric 22 and the central axis of the eccentric 22 is positioned in direct alignment with the axis of the crank pin 19 thereby determining the axial eccentricity of the entire dasher 4 in relation to the axial center of the drive shaft 9. There are three rollers 24 preferably equally spaced on 120 degree radial plane positions.

Referring to Fig. 1, it will be noted that the dasher 4 is shown as provided with a smooth-surfaced portion 42 forming a continuous imperforate circumferential wall substantially vertically disposed and having a relatively large diameter with respect to the internal diameter of the tub 2. However, the enlarged portion 42 is spaced an appreciable distance from the wall of the tub so as not to interfere with the free cyclic movement of the clothes therebetween. At the same time, this portion 42 extends down close to the bottom of the tub. The upper portion of the dasher 4 forms a column 43 of considerably smaller diameter than the diameter of the base portion 42.

The general contour and shape of the dasher, as viewed in Fig. 3, includes a plurality of radial vanes 44 extending from the base 42 to the upper end of the column 43 filling in the valley portion of the middle part of the dasher. These vanes 44 are supplemented by additional vanes 45 radially disposed between the vanes 44 to prevent clothes from hugging the body of the dasher and to increase the throbbing action in the water.

Through its rotation (with respect to the center post) and eccentric motion (with respect to the tub wall), the dasher 4 creates rapid continuous throbbing pulsations around its full circumference within the wash water creating submerged radial pulsations at a rapid rate determined by the rotational speed of the shaft 9, the base portion 42 of the dasher 4 imparting continuous radial water currents in a predetermined progression outwardly toward the tub walls and creating an inward suction downwardly therealong at the upper portion of the dasher, to recirculate radially inwardly toward the dasher and downwardly along the column and through the valleys of the same, such currents substantially following the paths of the arrows indicated in Fig. 1.

The washing effect of this machine is caused by the orbital motion of the dasher without appreciable axial rotation and preferably having vanes extending upwardly along the dasher. Each and every vane reciprocates radially inwardly and outwardly and transversely in both directions through a small circular path equal to the orbital throw of the dasher. The sidewise or transverse reciprocation, like a fish-tail action, creates continual alternating radial currents which, although minor in force, create a continuous cumulative suction that draws the clothes inwardly towards the top of the dasher and keeps them hugging the edges of the dasher vanes completely around the circumference of the dasher and from top to bottom. The radial reciprocation of the vanes alternately squeezes and releases the clothes hugging the dasher so that clothes being drawn into the dasher at the top may be sucked downwardly to displace the clothes below, that effectively rotates the clothes radially while slowly rotating the mass of clothes circumferentially. Although the clothes are sucked in to the dasher by water currents, the movement of the clothes thereafter appears to be almost entirely mechanical.

This washing action is quite different from the action of all axially-rotating washers and is particularly different from the action of the conventional submerged agitator washers. While the submerged agitator washers create a tremendous toroidal flow of water when the tub is empty of clothes, this toroidal water flow is reduced and almost eliminated when the tub is full of clothes and the clothes are riding the agitator blades. The turnover of the full tub of clothes in the submerged agitator machine is very slow when the toroidal water action is reduced, as contrasted to the action when the tub has a small load of clothes. In the present machine, there appears to be practically no toroidal flow of water when the tub is empty of clothes. With a full load of clothes, the clothes are rotated radially very effectively and, as a matter of fact, it appears that the rotation is faster with heavy loads than with lighter loads. In the axially rotating agitators, the clothes are dragged arcuately through the water by the axial rotation of the agitator as it moves through an arc of some 8 to 20 inches in length. In the present machine, the clothes ride lightly on the outer edges of the dasher vanes while the dasher vanes reciprocate in a circular path of about 1 inch in diameter. Whereas the axially rotating agitators exert slow heavy rotating scrubbing action on the clothes, the vanes of my dasher reciprocate very rapidly to create a light rubbing or fluttering action on the clothes. In general, I am able to wash effectively almost twice the weight of clothes per gallon of water, and wash this heavier load cleaner and faster, and with less wear on the clothes, and with less power input, than with conventional agitator machines.

It is worthy of careful note that the combination of the rapidly reciprocating radial vanes and rapidly pulsating water currents have the desirable effect of distributing the clothes evenly around the dasher so that all portions of the

batch of clothes are subjected to practically uniform washing treatment. Such clothes, however, have no effect whatever upon the bodily orbital motion of the dasher as the latter is positively driven by the unidirectional power drive means.

Referring now to Figs. 3 and 4, I will explain my improved dasher balancing device and my improved torsion spring rotating restrainer mechanism.

In order to counter-balance the out-of-balance eccentric rotation of the dasher 4 and its coacting parts, especially for a relatively long throw of circular orbit, or a relatively high speed of movement through the orbit, or both, I prefer to mount a counter-balance arm 60 under the eccentric bearing casting 22 on the dasher, by means of cap screws 61.

A counter-balance weight 62 is attached to the arm 60 by a locator lug 62', through an opening in the arm 60, and by crimping the lower edge 63 of the arm 60 around the counterweight 62. The counterweight 62 being separable and attachable to the arm 60 may be adjusted circumferentially or by replacement with a counterweight of a different size, to counter-balance the out-of-balance weight of the dasher 4 and its rotating parts. The counterweight being located within the dasher and substantially attached thereto, provides a sturdy compact means to attain a balanced dasher structure that will not vibrate or shake under the high rotational speeds required by my dasher mechanism.

Around the center post 12 and under the sleeve 17 is mounted a flanged washer 64 held in position on the center post 12 by a set screw 65. Radial extension 67 of a torsion spring 68 mounted on the post 12 abuts a radial flange 66 of the washer 64. On the opposite end of the torsion spring 68 is another radial abutment member 69 of the spring 68 which contacts an upright radial flange 70 of an arm 71 journaled on the center post 12.

On the opposite end of the arm 71 is mounted a roller 72 which is held in abutment with an angular stop stamping 73 mounted on the dasher body 20 by cap screws 74.

By this structure, it will be understood that the dasher 4 is restrained from rotation around the center post 12 by the torsion of the spring 68. Thus, while the dasher 4 may turn floatably around the center post 12, it is restrained in such movement by the torsion spring 68 until the elastic limit of said spring is reached, which may be adjusted by the strength of the spring 68 and by adjustment of the collar 64 by the set screw 65.

The tub 2, in Fig. 3, is mounted on a base support member 75 having a cone extension brace 76 to support effectively the lower end of the center post 12, as shown. A drive pulley 77 is mounted below the cone brace 76 and fastened to the drive shaft 9, as, for instance, by a set screw 78.

By this construction, it will be appreciated that the dasher 4 may be rotated rapidly about the center post 12, and the out-of-balance eccentric loading of the dasher will be counter-balanced effectively by the counter-balance weight 62 directly connected to the eccentric 22; also, that the axial rotation of the dasher 4 will be restrained by the torsion spring 68 against the arm 71 carrying a roller 72 bearing against the stop bracket 73 on the dasher body 20.

To summarize the action of the washing principle herein presented, the machine includes a tub that may be round, square or of other shape in contour, a vaned dasher in said tub, a drive mechanism having eccentric supporting bearings to carry the dasher, with the dasher being freely or floatably supported upon such bearings to seek its own angular positions relative to its own axis, and wherein the drive mechanism forces the dasher to move about the drive shaft in an orbit at a predetermined rate of speed, generally much faster than axially rotating impellers or agitators. I prefer a speed of the drive shaft 9 approximately at 215 R. P. M., and with a radius of circular orbit at approximately ½ inch. However, satisfactory results have been obtained at higher speeds up to 300 R. P. M., and also at lower speeds from 100 R. P. M. up, and with a larger radius of circular orbit, up to 2 inches.

In effect, the dasher actually rotates upon its own bearings at a rate of speed which causes it normally to stand still relative to the tub while the eccentric driving arrangement moves the dasher bodily through a circular orbit about the drive shaft. The action of the clothes moving radially inwardly toward and against the dasher and moving along the vanes thereon normally prevents rotation of the dasher relative to its assumed angular placement upon its supporting bearings.

Bunching or off-balance grouping of clothes which may occur only during the initial loading of the machine, will act upon the dasher to adjust themselves automatically about the dasher under uniform water current pulsations to surround equally the dasher, thereby distributing the washing load. With this construction, the clothes actually maintain their equally distributed positions through the washing operation while the machine subjects all the clothes to the same cleansing action, which is a combination of slow rotation around the tub, and cyclic toroidal rolling in relatively faster water currents.

Changes in the exact construction and combination of parts of the washing machine and its embodied mechanism are contemplated. All such modifications and substitution of equivalent means in the design of the preferred construction shown and described shall be governed by the breadth and scope of the appended claims submitted herewith and defining the fundamental structure of the present invention.

I claim:

1. In a washing machine, the combination with a receptacle adapted to contain a body of liquid for washing fabrics therein, a drive shaft, a dasher in the receptacle, means journaling the dasher on the drive shaft for rotation about an axis offset eccentrically of the axis of the drive shaft for movement of the dasher bodily through an orbit upon rotation of the drive shaft, an arm connected with the dasher and extending laterally of the drive shaft approximately in the opposite direction from the direction of the offset relation of the dasher relative to the drive shaft, and a counterweight carried by said arm.

2. In a washing machine, the combination with a receptacle adapted to contain a body of liquid for washing fabrics therein, a drive shaft extending upwardly in the receptacle, a dasher in the receptacle, means journaling the dasher on the drive shaft for relative rotation about an axis offset eccentrically of the axis of the drive shaft for movement of the dasher bodily through an orbit upon rotation of the drive shaft, bearing

means surrounding the drive shaft adjacent the lower portion of the dasher and journaling the dasher thereon, an arm connected with the journaling means and extending laterally of the drive shaft approximately in the opposite direction from the direction of the offset relation of the dasher relative to the drive shaft, and a counterweight carried by said arm.

3. In a washing machine, the combination with a receptacle adapted to contain a body of liquid for washing fabrics therein, a drive shaft journaled in the receptacle, and a dasher connected with the drive shaft in the receptacle and mounted for orbital movement about an upright axis relative thereto upon rotation of the drive shaft, of means for restraining the dasher against axial rotation during said orbital movement and including a torsion spring connected with the dasher and with the receptacle in restraining relation on the dasher.

4. In a washing machine, the combination with a receptacle adapted to contain a body of liquid for washing fabrics therein, a drive shaft journaled in the receptacle, and a dasher connected with the drive shaft in the receptacle and mounted for orbital movement about an upright axis relative thereto upon rotation of the drive shaft, of means for restraining the dasher against axial rotation during said orbital movement and including a torsion spring connected at one portion thereof with the receptacle and at the opposite end portion thereof with the dasher.

5. In a washing machine, the combination with a receptacle adapted to contain a body of liquid for washing fabrics therein, a drive shaft journaled in the receptacle, and a dasher connected with the drive shaft in the receptacle and mounted for orbital movement relative thereto upon rotation of the drive shaft, of means for restraining the dasher against axial rotation during said orbital movement and including a torsion spring having one end anchored to the receptacle, an arm projecting outwardly and connected with the other end of the torsion spring, and abutment means between said arm and the dasher for limiting relative rotation of the dasher.

6. In a washing machine, a tub adapted to contain a body of water for washing clothes therein, a drive shaft journaled for rotation relative to the tub, a dasher in the tub and eccentrically connected with the drive shaft for movement thereby in an orbit relative to the axis of the shaft, means forming an abutment in the path of movement of the dasher through the orbit for restraining the dasher against rotation about its own axis during movement thereof through the orbit, and an elongated spring member fixed at one end portion thereof to the tub and connected at the opposite end portion thereof with the abutment means providing for yielding action of the abutment means for yieldably restraining the movement of the dasher about its own axis.

7. In a washing machine, a tub adapted to contain a body of water for washing clothes therein, a drive shaft journaled for rotation relative to the tub, a dasher in the tub and eccentrically connected with the drive shaft for movement thereby in an orbit relative to the axis of the shaft, and means for yieldably restraining the dasher against rotation about its own axis during movement thereof through the orbit, including an arm substantially fixed relative to the tub and forming an abutment in the path of movement of the dasher through the orbit, and a torsion spring connected at opposite end portions thereof with the tub and the arm and yieldably holding the arm substantially in said fixed relation in the tub.

8. In a washing machine, a tub adapted to contain a body of water for washing clothes therein, a drive shaft journaled for rotation relative to the tub, a dasher in the tub and eccentrically connected with the drive shaft for movement thereby in an orbit relative to the axis of the shaft, said dasher being offset bodily in one direction from the drive shaft, and a counter-weight offset laterally from the drive shaft substantially in the opposite direction from the offset relation of the dasher with respect thereto, and fixed to the dasher in position to counterbalance the unbalanced orbital movement of the dasher relative to the drive shaft.

9. In a washing machine, a tub adapted to contain a body of water for washing clothes therein, a drive shaft journaled for rotation relative to the tub, a dasher in the tub and eccentrically connected with the drive shaft for movement thereby in an orbit relative to the axis of the shaft, said dasher being offset bodily in one direction from the drive shaft, and means projecting laterally from the drive shaft substantially in the opposite direction from the offset relation of the dasher with respect thereto, and fixed to the dasher in position to counterbalance the unbalanced orbital movement of the dasher relative to the drive shaft, said counterbalance means including a weight arranged to counterbalance the weight of the dasher eccentrically of the axis of the drive shaft.

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